PATENT ABSTRACTS OF JAPAN

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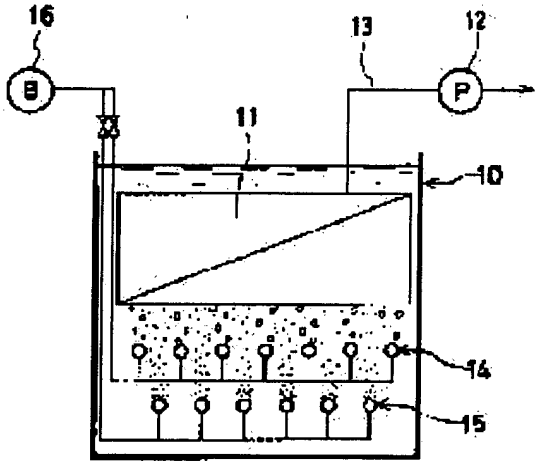
(54) IMMERSION MEMBRANE APPARATUS

(57)Abstract:

PURPOSE: To effectively peel the gel layer and cake layer bonded to a membrane surface, in an immersion membrane apparatus wherein a membrane unit is immersed in the liquid of a treatment tank and the filtered treated water transmitted through a membrane is obtained, by providing the apparatus with a coarse air bubble diffusing device and a fine air bubble diffusing device under the membrane unit within the treatment tank.

CONSTITUTION: The immersion membrane apparatus wherein a membrane unit 11 is immersed in the liquid of a treatment tank 10 and the filtered treated water transmitted through a membrane is obtained, is provided with a coarse air bubble diffusing device 14 and a fine air bubble diffusing device 15 under the membrane unit 11 within the treatment tank 10. By this constitution, the gel layer and cake layer bonded to a membrane surface are effectively peeled by the min. energy of air bubbles and an effective membrane area contributing to filtering is largely taken and, therefore, the filtered flux transmitted through the membrane surface is always held to the best state and filtering can be performed by low energy.



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審査請求　未請求　請求項の数１　ＦＤ　（全３頁）

(21)出願番号　特願平5－345956

(22)出願日　平成５年(1993)12月24日

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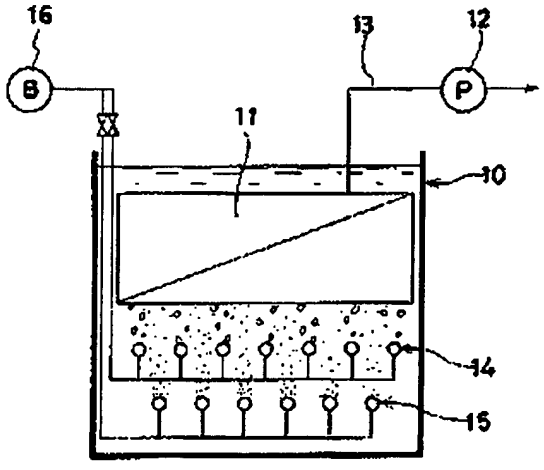
(54)【発明の名称】　浸漬膜装置

(57)【要約】
【目的】　膜面に付着するゲル層、ケーク層を散気装置から噴出する気泡で効果的に剥離する。
【構成】　処理槽１０の液中に膜ユニット１１を浸漬し、膜を透過した透過処理水を得る浸漬膜装置において、処理槽内の膜ユニットの下方に粗大気泡の散気装置１４と、微細気泡の散気装置１５を設ける。



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【特許請求の範囲】

【請求項１】　処理槽の液中に膜ユニットを浸漬し、膜を透過した濾過処理水を得る浸漬膜装置において、処理槽内の膜ユニットの下方に粗大気泡の散気装置と、微細気泡の散気装置を設けたことを特徴とする浸漬膜装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、平膜を複数枚積層した積層体や、中空糸膜を平面状、或いはすだれ状にした膜エレメントを複数枚積層した積層体や、管状膜を複数本並行に接続したものを膜ユニットとして用いた浸漬膜装置に関する。

【０００２】

【従来の技術】処理槽の液中に上述した膜ユニットを浸漬し、膜ユニットの内部を吸引して膜を透過した濾過処理水を得る浸漬膜装置は従来から公知である。この浸漬膜装置を運転して膜濾過を行った場合、濾過の進行に伴い膜面近傍に高分子溶存物質等の高濃度な濃度分極層、或いはこれがゲル状になったゲル層などの非濾過物質が存在するようになると共に、微細な粒子、生物フロック、金属水酸物等の非濾過物質からなるケーク層が膜面に付着する。ケーク層の濾過抵抗の成長速度はゲル層と比較して極めて緩やかであるが、厚い付着層を形成する。これらのゲル層やケーク層によって濾過抵抗が生じ、濾過効率が低下する。そこで、一定時間、膜濾過を行ったら、又は膜濾過運転中に一定濾過圧力になる毎に運転を中止し、膜ユニットに下から気泡を浴びせ膜の間を浮上する気泡と、上向水流とによりゲル層や、ケーク層を膜面から剥離したのち逆洗を行い、濾過性能を回復させる。尚、散気は逆洗の前だけでなく、逆洗の後にも行うことがある。

【０００３】

【発明が解決しようとする課題】しかし、従来は散気によって膜面からゲル層やケーク層を剥離、除去するのに非常に時間がかかる。従って、散気装置を駆動する動力コストも非常に嵩む。

【０００４】

【課題を解決するための手段】そこで、本発明は、処理槽の液中に膜ユニットを浸漬し、膜を透過した濾過処理水を得る浸漬膜装置において、処理槽内の膜ユニットの下方に粗大気泡の散気装置と、微細気泡の散気装置を設けたことを特徴とする。

【０００５】

【実施例】図示の実施例において、１０は処理槽で、処理槽の液中には膜ユニット１１が浸漬してあり、ポンプ１２を接続した吸引管１３が膜ユニットの内部を吸引し、処理槽内の原液中、膜ユニット１１を透過したものを濾過処理水として採水する。膜ユニットは、前述したように平膜の複数枚の積層体、又は中空糸膜を平面状、或いはすだれ状にした膜エレメントの複数枚の積層体、

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又は管状膜を複数本並行に接続したものである。

【０００６】濾過の進行に伴い濾過抵抗を生じさせる前述の濃度分極層ないしゲル層と、ケーク層を気泡により膜面から効果的に剥離すべく、気泡の大きさと、その効果の関係に付いて研究した結果、以下のことが明らかになった。先ず濃度分極層ないしゲル層の抑制には、処理槽内の液に膜面沿いの大流速を与えることが効果的であり、それには直径３ｍｍ以下の微小気泡による方が効果が高い。これは、微小気泡の方がホールドアップ（気泡混合部の気体の割合い）が大きくなり、エアリフト循環流量が増大するためであって、粗大気泡で同じ効果を得るには散気量を大幅に増す必要があり、エネルギー消費が大になる。

【０００７】又、膜面に付着するケーク層を剥離するには、直径１０ｍｍ以上の粗大気泡を膜面に衝突させることが効果的である。これはケーク層の剥離が気泡の界面での剪断力に起因するため、或る程度大きな気泡でないと剥離に寄与しないからである。逆にいうと微小な気泡をいくら散気し、膜面に衝突させてもケーク層は剥離しないということである。要するに、微小気泡のみを散気した場合には濃度分極層の抑制には効果的ではあるが、ケーク層を剥離することはできないため濾過抵抗が経時的に増大し、膜面を透過する濾過流速は低下する。又、粗大気泡のみを散気した場合は膜面流速を与えるためには多大の散気量を必要とし、エネルギーロスが大になる。

【０００８】このため、濾過槽内の、膜ユニット１１の下方に、膜ユニットの下面全体に気泡を作用させるための散気孔が大きな粗大気泡用の散気装置１４と、散気孔が小さい微小気泡用の散気装置が設けてあり、この実施例では共通のブロワ１６で給気するようになっている。

【０００９】従って、膜濾過を一定時間行ったら、又は膜濾過の運転中に一定濾過圧力に達したら、運転を中止し、逆洗を行う前後に、両散気装置１４，１５を同時に連続的、或いは間欠的に作動するか、微小気泡の散気装置１５のみ連続的に作動し、粗大気泡の散気装置１４は間欠的に作動させるか、又は両散気装置１４，１５を共に間欠的に作動させるが、粗大気泡の散気装置の散気時間を短く（散気の中断間隔を長くすることを含む）するといった具合に両散気装置を運転し、粗大気泡と、微小気泡を膜ユニットの膜面に作用させる。尚、散気に付いて実施例では膜の運転を中止した後に行う逆洗の前後に行うもので説明したが、これに限らず膜の運転中に常時行うものでもよい。

【００１０】

【発明の効果】これにより膜面に付着するゲル層、ケーク層を気泡を最小のエネルギーで効果的に膜面から剥離し、濾過に寄与する有効膜面積を大きくとれるため膜面を透過する濾過流束を常時、最良の状態に保ち、低エネルギーで濾過を行うことができる。

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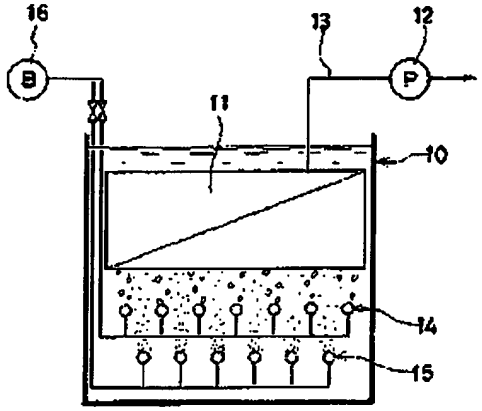
【図面の簡単な説明】

【図1】本発明の一実施例の断面図である。

【符号の説明】

10　処理槽
11　膜ユニット
＊12　ポンプ
13　吸引管
14　粗大気泡用の散気装置
15　微小気泡用の散気装置
＊16　ブロワー

【図1】



JAPANESE [JP,07-185270,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] Immersion film equipment characterized by the thing of the film unit in a processing tub caudad established for the diffuser of big and rough air bubbles, and the diffuser of detailed air bubbles in the immersion film equipment which obtains the filtration treated water which was immersed in the film unit into the liquid of a processing tub, and penetrated the film.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to immersion film equipment using the layered product which carried out two or more sheet laminating of the layered product which carried out two or more sheet laminating of the flat film, and the membrane element which made the hollow fiber the shape of a plane or a blind, and the thing which connected the tubular film [two or more] as a film unit.
[0002]
[Description of the Prior Art] The immersion film equipment which obtains the filtration treated water which was immersed in the film unit mentioned above in the liquid of a processing tub, attracted the interior of a film unit, and penetrated the film is well-known from the former. the cake which consists of non-filtering matter, such as a detailed particle, living thing flocks, and a metal hydroxy compound, while non-filtering matter, such as a high concentration macromolecule dissolved material concentration polarization layer or a gel layer from which this became gel, comes to exist near the film surface with advance of filtration, when this immersion film equipment is operated and membrane filtration is performed -- a layer adheres to a film surface. a cake -- although the growth rate of the filtration resistance of a layer is very loose as compared with a gel layer, a thick adhesion layer is formed. these gel layers and cakes -- by the layer, filtration resistance arises and a filtration efficiency falls. then, the air bubbles which will stop operation whenever it becomes fixed filtration pressure during membrane filtration operation, will shower air bubbles over a film unit from the bottom, and will surface between film if fixed time amount and membrane filtration are performed and an ascending stream -- a gel layer and a cake -- after exfoliating a layer from a film surface, a back wash is performed, and a filtration efficiency is recovered. In addition, aeration may be performed not only before a back wash but after a back wash.
[0003]
[Problem(s) to be Solved by the Invention] however, the former -- aeration -- the gel layer from a film surface, and a cake -- exfoliating and removing a layer -- very much -- time amount -- ******. Therefore, the power cost which drives a diffuser also increases very much.
[0004]
[Means for Solving the Problem] Then, this invention is immersed in a film unit into the liquid of a processing tub, and is characterized by the thing of the film unit in a processing tub caudad established for the diffuser of big and rough air bubbles, and the diffuser of detailed air bubbles in the immersion film equipment which obtains the filtration treated water which penetrated the film.
[0005]
[Example] In the example of illustration, 10 is a processing tub, and into the liquid of a processing tub, it is immersed in the film unit 11, and the siphon 13 which connected the pump 12 attracts the interior of a film unit, and it bottles what penetrated the film unit 11 as filtration treated water among the undiluted solution in a processing tub. A film unit connects the layered product of two or more sheets of a flat film, the layered product of two or more sheets of the membrane element which made the hollow fiber the shape of a plane or a blind, or the tubular film [two or more], as mentioned above.
[0006] the above-mentioned concentration polarization layer thru/or gel layer which produces filtration resistance with advance of filtration, and a cake -- the following things became clear as a result of attaching and studying a layer in the magnitude and the relation of effectiveness of air bubbles that it should exfoliate

effectively from a film surface with air bubbles. It is higher for effectiveness it to be effective for control of a concentration polarization layer thru/or a gel layer to give the large rate of flow along a film surface to the liquid in a processing tub, and to be first, based on minute air bubbles with a diameter of 3mm or less at it. It is for a hold up (rate of the gas of the cellular mixing section) to become [the direction of minute air bubbles] large, and, as for this, for the amount of airlift circulating flow to increase, it is necessary to increase the amount of aeration sharply to acquire the same effectiveness by big and rough air bubbles, and energy expenditure becomes size.

[0007] moreover, the cake adhering to a film surface -- in order to exfoliate a layer, it is effective to make big and rough air bubbles with a diameter of 10mm or more collide with a film surface. this -- a cake -- since exfoliation of a layer originates in the shearing force in the interface of air bubbles -- a certain grade -- it is because it does not contribute to exfoliation unless it is big air bubbles. on the contrary -- when it says, even if it carries out aeration of the minute air bubbles and makes them collide with a film surface how much -- a cake -- I hear that a layer does not exfoliate and there is. although it is effective for control of a concentration polarization layer in short when aeration only of the minute air bubbles is carried out -- a cake -- since a layer cannot be exfoliated, filtration resistance increases with time and the filtration rate of flow which penetrates a film surface falls. Moreover, when aeration only of the big and rough air bubbles is carried out, in order to give the film surface rate of flow, the great amount of aeration is needed, and an energy loss becomes size.

[0008] For this reason, the diffuser 14 for big and rough air bubbles with the big powder pore for making air bubbles act on the whole inferior surface of tongue of a film unit caudad of the film unit 11 in a lauter tub and the diffuser for minute air bubbles with small powder pore are formed, and air supply are carried out by the common blower 16 in this example.

[0009] Therefore, membrane filtration If it carries out fixed time, or when reaching during operation of membrane filtration at fixed filtration pressure Before and after stopping operation and performing a back wash, only the diffuser 15 of minute air bubbles operates continuously by operating both the diffusers 14 and 15 continuously or intermittently to coincidence, and although the diffuser 14 of big and rough air bubbles makes it operate intermittently or both the diffusers 14 and 15 are both operated intermittently Both diffusers are operated in condition of shortening the aeration period of the diffuser of big and rough air bubbles (it including lengthening interruption spacing of aeration), and big and rough air bubbles and minute air bubbles are made to act on the film surface of a film unit. In addition, although it carries out before and after the back wash performed after being attached to aeration and stopping operation of the film by the example and being explained, it may always carry out during operation of not only this but the film.

[0010]

[Effect of the Invention] the gel layer and cake which adhere to a film surface by this -- air bubbles can be effectively exfoliated from a film surface with the minimum energy in a layer, since the large effective film surface product which contributes to filtration can be taken, the filtration flux which penetrates a film surface can always be maintained at the best condition, and it can filter by low energy.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] This invention relates to immersion film equipment using the layered product which carried out two or more sheet laminating of the layered product which carried out two or more sheet laminating of the flat film, and the membrane element which made the hollow fiber the shape of a plane or a blind, and the thing which connected the tubular film [two or more] as a film unit.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The immersion film equipment which obtains the filtration treated water which was immersed in the film unit mentioned above in the liquid of a processing tub, attracted the interior of a film unit, and penetrated the film is well-known from the former. the cake which consists of non-filtering matter, such as a detailed particle, living thing flocks, and a metal hydroxy compound, while non-filtering matter, such as a high concentration macromolecule dissolved material concentration polarization layer or a gel layer from which this became gel, comes to exist near the film surface with advance of filtration, when this immersion film equipment is operated and membrane filtration is performed -- a layer adheres to a film surface. a cake -- although the growth rate of the filtration resistance of a layer is very loose as compared with a gel layer, a thick adhesion layer is formed. these gel layers and cakes -- by the layer, filtration resistance arises and a filtration efficiency falls. then, the air bubbles which will stop operation whenever it becomes fixed filtration pressure during membrane filtration operation, will shower air bubbles over a film unit from the bottom, and will surface between film if fixed time amount and membrane filtration are performed and an ascending stream -- a gel layer and a cake -- after exfoliating a layer from a film surface, a back wash is performed, and a filtration efficiency is recovered. In addition, aeration may be performed not only before a back wash but after a back wash.

[Translation done.]

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, the former -- aeration -- the gel layer from a film surface, and a cake -- exfoliating and removing a layer -- very much -- time amount -- ******. Therefore, the power cost which drives a diffuser also increases very much.

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MEANS

[Means for Solving the Problem] Then, this invention is immersed in a film unit into the liquid of a processing tub, and is characterized by the thing of the film unit in a processing tub caudad established for the diffuser of big and rough air bubbles, and the diffuser of detailed air bubbles in the immersion film equipment which obtains the filtration treated water which penetrated the film.

[Translation done.]

EXAMPLE

[Example] In the example of illustration, 10 is a processing tub, and into the liquid of a processing tub, it is immersed in the film unit 11, and the siphon 13 which connected the pump 12 attracts the interior of a film unit, and it bottles what penetrated the film unit 11 as filtration treated water among the undiluted solution in a processing tub. A film unit connects the layered product of two or more sheets of a flat film, the layered product of two or more sheets of the membrane element which made the hollow fiber the shape of a plane or a blind, or the tubular film [two or more], as mentioned above.

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[0008] For this reason, the diffuser 14 for big and rough air bubbles with the big powder pore for making air bubbles act on the whole inferior surface of tongue of a film unit caudad of the film unit 11 in a lauter tub and the diffuser for minute air bubbles with small powder pore are formed, and air supply are carried out by the common blower 16 in this example.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view of one example of this invention.
[Description of Notations]
10 Processing Tub
11 Film Unit
12 Pump
13 Siphon
14 Diffuser for Big and Rough Air Bubbles
15 Diffuser for Minute Air Bubbles
16 Blower

[Translation done.]

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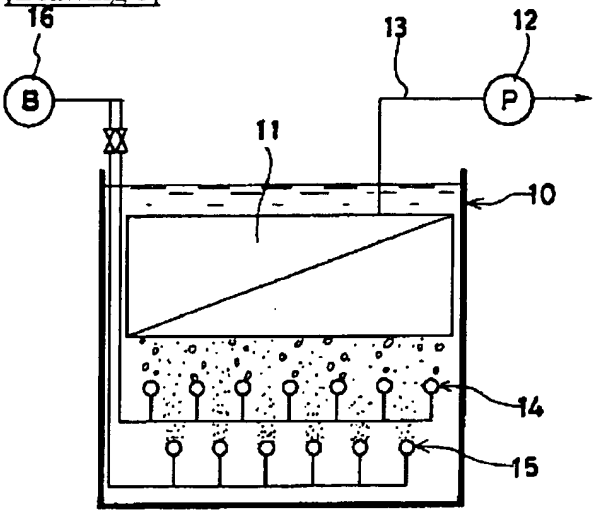
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Translation done.]